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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/593,038

09/15/2006

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6005

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EXAMINER

ALI, MOHAMMAD M

ART UNIT

PAPER NUMBER

3744

NOTIFICATION DATE

DELIVERY MODE

09/22/2009

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/593,038	<b>Applicant(s)</b> SAKITANI ET AL.	
	<b>Examiner</b> MOHAMMAD M. ALI	<b>Art Unit</b> 3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 September 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-3 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 September 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☒ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>09/15/06</u> .  | 6) <input type="checkbox"/> Other: _____                          |

***Claim Rejections - 35 USC § 103***

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1-3 are rejected under 35 U.S.C. 102(a) as being anticipated by Sienel (US 6,898,941). Sienel discloses a refrigeration system including a refrigerant circuit (35) in which a compressor (39), a gas cooler (24), an expander (27) and an evaporator (28) are connected, the refrigeration system operating in a refrigeration cycle having a high-side refrigerant pressure equal to or above the critical pressure (the refrigerant being CO<sub>2</sub>, see column 1, line 20, the pressure and temperature of Co<sub>2</sub> is critical, pressure becomes function of the density, see column 1, lines 26-28), of the refrigerant by circulating the refrigerant through the refrigerant circuit (35), wherein the compressor (39) and the expander (27) are each composed of a displacement fluid machine whose fluid chamber is variable in volume and are connected one to the other with the rotational speed ratio of the one to the other fixed, and the volume  $v_2$  of the fluid chamber in the expander (27) just after the closing off of fluid communication from an inlet channel thereof is set to  $v_2 = p_{lv} / p_2$  and the volume  $v_3$  of the fluid chamber in the expander (27) just before the provision of fluid communication with an outlet channel thereof is set to  $v_3 = p_{Ev} / p_3$ , where: the low-side refrigerant pressure of the refrigeration cycle and the refrigerant

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temperature at the exit of the gas cooler (24) under reference operating conditions serving as a design standard are employed as a reference low pressure and a reference refrigerant temperature, respectively; the high-side refrigerant pressure of the refrigeration cycle at which the coefficient of performance of the refrigeration cycle reaches a maximum value under the reference operating conditions is employed as a reference high pressure;

$p_1$  is the density of saturated gas refrigerant at the reference low pressure;

$p_2$  is the density of refrigerant at the reference high pressure and the reference refrigerant temperature;

$P_3$  is the density of refrigerant adiabatically expanded from a condition of the reference high pressure and the reference refrigerant temperature into a condition of the reference low pressure;  $v_l$  is the volume of the fluid chamber in the compressor (39) just after the closing off of fluid communication from a suction channel thereof; and  $r$  is the rotational speed ratio of the compressor (39) to the expander (27).

Regarding the recitation, "the volume  $v_2$  of the fluid chamber in the expander (27) just after the closing off of fluid communication from an inlet channel thereof is set to  $v_2 = p_l v_l r / p_2$  and the volume  $v_3$  of the fluid chamber in the expander (27) just before the provision of fluid communication with an outlet channel thereof is set to  $v_3 = p_e v / p_3$ , where: the low-side refrigerant pressure of the refrigeration cycle and the refrigerant temperature at the exit of the gas cooler (24) under reference operating conditions serving as a design standard are employed as a reference low pressure and a

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reference refrigerant temperature, respectively; the high-side refrigerant pressure of the refrigeration cycle at which the coefficient of performance of the refrigeration cycle reaches a maximum value under the reference operating conditions is employed as a reference high pressure” is a known mathematical algorithm which is valid for a supercritical fluid and CO<sub>2</sub> being supercritical fluid, that mathematical algorithm or equation is valid for CO<sub>2</sub> and can be achieved by the above device as it is capable to function accordingly.

Regarding claim 2, Sienel discloses that the refrigerant circuit (35) is provided with a receiver (29) between the exit side of the evaporator (28) and the suction side of the compressor (39).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sienel.

Regarding claim 3, Sienel discloses that the refrigerant circuit (35) is provided with an internal heat exchanger (25, See Figs 5A and 5B) for providing heat exchange between refrigerant flowing from the gas cooler (24) towards the expander (27) and refrigerant flowing the pipe at a point before the evaporator (28) towards the compressor (32, see Fig. 5A or 5B). However, Sienel does not disclose the tapping of the refrigerant after the evaporator 28. The internal heat exchanger of the invention type is well known in the art. In addition, an ordinary skill of art with the teaching of Sienel is able to tap at any point on the pipe connecting between the compressor 32 and the evaporator 28; alternatively, when both the system connecting the internal heat exchanger by pipe tapped before or after the evaporator is known, it is an obvious choice of an individual skilled in the art to connect the internal heat exchanger by a refrigerant pipe tapped from a pipe at a point either before or after the evaporator.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sienel in view of Nakatani et al (US 20040118138A1). Sienel discloses the invention substantially as claimed as stated above except the heat exchanging between an internal heat exchanger and the refrigerant flowing from the evaporator towards the compressor. Nakatani et al teach the use of an internal heat exchanger (80) exchanging heat between refrigerant flowing from the gas cooler (3, outdoor heat exchanger) towards the expander (6) and the refrigerant flowing from the evaporator (8, indoor heat exchanger)

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towards the compressor (1) in a refrigeration system using carbon dioxide as a refrigerant for the purpose of efficiently running the refrigeration system. See Fig 4.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the refrigeration system of Sienel in view of Nakatani et al such that a refrigerant flow line for exchanging heat with an internal heat exchanger could be provided with refrigerant flowing from the evaporator towards the compressor in order to efficiently exchanging heat and efficiently running the refrigeration system.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MOHAMMAD M. ALI whose telephone number is (571)272-4806. The examiner can normally be reached on maxiflex.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl J. Tyler can be reached on 571-272-4808. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mohammad M Ali/  
Primary Examiner, Art Unit 3744